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DEPARTMENT OF THE ARMY  
US ARMY COMBAT DEVELOPMENTS COMMAND  
Liaison Detachment, HQ USAHV  
APO San Francisco 96375

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CDCS-LV

SUBJECT: Trip Report - ~~13-68~~ SK-5 Air Cushion Vehicle

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15 August 1968

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14 Trip-39-68

WAS VISITED

1. On 6-7 August 1968, LTC Harper visited the Air Cushion Vehicle Unit which is attached to the 9th Infantry Division for operations and evaluation. Purpose of the visit was to determine what doctrine and techniques of employment are being used, the optimum organization for combat operations and material aspects of the unit.

2. Individuals contacted were:

MG Ewell	-	Div CG
MAJ Moore	-	ACV Unit CO
SSG Burton	-	ACV Cmdr
SSG Herford	-	ACV Driver

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3. The following paragraphs contain a narrative of the doctrine, organization, equipment and training of the unit. The information was compiled from interviews with personnel of the unit and the observations of LTC Harper. The reader is reminded that the doctrine and techniques stated in this report are projected for a larger organization based on the combat experiences of the current unit, equipped with three air cushion vehicles. Inclosure 1 contains answers to specific ~~REA~~ that were designed to provide a basis for further study, documentation and decisions concerning the air cushion vehicle concept.

4. Definitions.

a. Air Cushion Vehicle (ACV). A vehicle designed to skim the surface on a cushion of air created by a horizontally mounted fan which forces air downward and beneath the craft. Propulsion is achieved by a rear mounted propeller. Both the fan and propeller are powered by a single turbine engine. (This discussion differentiates between ACV configurations by describing

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4 DIST. AVAIL the craft with the same basic silhouette in two different sizes. This size difference could exist in the vehicles or the basic vehicle may be the same size with different weapons configurations.)

b. Air Cushion Combat Vehicle (ACCV). An ACV (SK-6) configured as a tactical transport, command, or combat service support vehicle dependent on the element to which assigned. It may be used in any of these applications when such employment is dictated by mission requirements.

c. Air Cushion Assault Vehicle (ACAV). An ACV (SK-5) configured to provide organic surface fire support for the unit or element. It is organic to the light and heavy assault platoons of the proposed ACV troop (Incl 2). This vehicle performs missions that are now being conducted by the scout, tank and support sections of the armored cavalry platoon. Its weapons configuration may include fixed mounts for two al. .50 machine guns, 20mm cannon or automatic grenade launchers (on top of cabin), and two M5 (40mm grenade) armament systems mounted on forward firing platforms. In addition, universal weapon pylons may be mounted on each side of the cabin (attached to cabin or deck). These pylons will accommodate a variety of weapons systems dependent on the vehicle mission requirements. Type forward firing armament systems that should be evaluated are: 106 or a similar type recoilless rifle, TOW or Shillelagh missile systems and FFAR rockets. Fires to the side can be provided by gunners armed with the M60 machine gun and/or automatic grenade launchers.

5. Doctrine and Techniques. The tactics being applied by the ACV unit follow those of standard cavalry organizations. Armor or armored cavalry trained officers and enlisted men will feel completely "at home" in regard to operation of the vehicles and employment of the unit. Instructions on the mechanical operation and maintenance of the vehicle is the major training requirement. With adequate weapons systems, an ACV unit of troop size can be employed on reconnaissance and surveillance missions and provide security for the unit to which assigned. The troop will also be capable of engaging in offensive, defensive and delaying actions as an economy of force unit. The unit can support waterborne forces or forces operating on land. By projecting the size of the organization, the writer of this report can visualize a battalion of infantry equipped with ACVs operating in the Mekong Delta area in much the same manner as mechanized infantry would operate on dry land. Operations have been conducted by mechanized infantry across partially in undated rice paddies and marsh areas. With ACVs, this same infantry unit would not be hampered by the myriad of variations in land and water found in riverine areas. Additionally, the movement of such an operation would

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be much more rapid. The ACV negotiates vertical obstacles 3½ feet high, crosses rice paddies, low dikes, swamp forests of trees smaller than five inches in diameter and one row thick, elephant grass 6 feet tall, climbs slopes to ten percent and higher slopes for short distances. It can move at speeds in excess of 25 knots while traversing these types of terrain. In short, it is the opinion of the present ACV commander and this report writer that the ACV can provide to the commander of forces in riverine areas, the mobility, firepower, and shock effect of armored and armored cavalry units currently available only to commanders operating in dry land areas. Listed below are examples of how a platoon of three vehicles may be employed. Inclosure 3 contains an after action report.

a. Three ACVs working in conjunction with a light fire team: This force can conduct detailed reconnaissance of a specific target area developed from the radar surveillance or other targeting means. The fire team provides navigation assistance to the ACVs, long range reconnaissance, and application of immediate aerial fire power to engaged targets. The ACVs provide detailed reconnaissance, on the ground search of developed targets or areas inaccessible to aerial examination, and direct, ground level fires on fleeing or entrenched targets. The combination can be used when light contact is expected.

b. Three ACVs operating in conjunction with one LOH: This force conducts high speed, general reconnaissance of a broad area of unknown enemy activity. It can ferret out base areas and suspected LOCs. The LOH provides navigation assistance and longer range observation. This team is used when little enemy contact is expected.

c. Three ACVs attached to an air cavalry troop: The ACVs provide the detailed surface search of targets identified by the air cavalry troop. Working together, they can block enemy routes of movement, fix enemy forces for exploitation by airmobile infantry, identify limits of contact and engage moving or stationary enemy units. When used in a mutually supporting role, this force combines the best characteristics of both helicopters and ACVs. It is used where heavy enemy contact is expected.

d. Troop lift for maneuver units: Each ACV can carry 9 to 12 combat troops riding on the decks outside the cabin. This provides the capability for rapid relocation of an infantry platoon in a single 3 ACV lift during daylight and over difficult terrain. With an improvement in night vision devices, this capability can be extended to the hours of darkness. This combined ACV/infantry team can be employed as a pursuit, blocking or search/sweep force.

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e. Night Surveillance: The on-board DECCA 202 radar and the fast closing speed of the ACV allow the craft to be utilized in night surveillance and LOC interdiction of waterways. After deception operations to cover movement, the ACVs can be shut down and used to establish an observation post. Utilizing their radar and night vision devices, the ACVs can plot enemy movements to establish habits of operation, or can maneuver to engage watercraft operating under the cover of darkness. With adequate ground radar, this type of operation could be extended to land operations.

f. LRP insertions and extractions: The high speed and marginal terrain crossing and stopping capability of ACVs make them suited to LRP operations. Used in conjunction with deception operations, the ACVs can insert or extract several LRPs in one mission. In areas with tree lines or steep canal banks, concealment is afforded the operation and can hide the ACV movement. With improved land navigation equipment, accurate positioning of LRPs at night is possible.

g. ACVs with a platoon of airboats: For wide ranging reconnaissance missions in predominantly wet areas, where little enemy contact is expected, the ACV capabilities can be used to complement the airboat capabilities. ACVs with airboats can carry out a detailed search and sweep of such areas as the Plain of Reeds, periphery of U Minh Forrest and the Rung Sat Special Zone. They can also be used in surveillance and daily patrol of enemy LOCs in these areas, obtaining intelligence for employment of heliborne forces.

h. Emergency med-evac, resupply, command and control, and repositioning of lightweight artillery: The inside clear cabin space of 65 square feet, flat outside decks (6 feet wide each), approximately 6,000 lbs of emergency load lift capability, and high speed offer opportunities for utilization of ACVs in various logistical or command roles. An experiment is being conducted by the present ACV unit to determine if ACVs can carry 102 model 105mm howitzers. If so, rapid all-weather repositioning of artillery over marginal terrain becomes feasible. An all-weather, highly mobile CP can be provided company or battalion commanders and med-evac to either ship or shore installations can be accomplished with a relatively stable ride for the patient.

6. Organization. Based on the experiences of the present ACV unit in RVN, it appears that three or four vehicles will provide the best platoon organization for combat operations. Five vehicles (standard tank platoon) would

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be too difficult to control because of the wide dispersion between the ACVs when operating in flat, open terrain such as the Plain of Reeds. When traversing narrow canals, the best formation found to date, is the "V" or inverted wedge formation. This allows the rear of the two front craft to be protected by the third craft, which, because of it being a single vehicle, can operate in the middle of the channel, thereby reducing the chance of ambush from the banks. A platoon of three vehicles has the capability to find the enemy, make contact, and maintain that contact for short periods of time. A larger organization is necessary if any extensive operations are planned or if the ACV unit is tasked to do more than establish contact. The platoon, however, can provide the base of fire or maneuver element for other type forces. It is recommended that in order to provide a valid evaluation of the air cushion concept, that an organization tailored along the guidelines set forth in the proposed TOE at Inclosure 2 be activated for operations in RVN. It is essential that an organization of troop size contain a direct support maintenance capability. As for other logistical support current doctrine will suffice except in the area of fuel resupply. Because the terrain over which the organization will operate will normally be impassable to conventional vehicles, fuel, along with fuel pumps, must be supplied by helicopter. There is the possibility that an SK-6 ACV could be configured to carry a fuel resupply for the unit, however for self-protection a resupply vehicle would be required to travel with the platoons, making it highly vulnerable to enemy fire. If the tanker is left at the operating base and then brought forward for refueling operations, it will require the use of combat ACVs to function as escort vehicles. Therefore, it would appear that helilift refueling would be the most practical in the near time frame. However, it may be within the current state of the art to devise a platform that has an air cushion effect, but with no propulsion. This "trailer" could then be pulled by an SK-6 ACV and perhaps provide enough payload that it would be beneficial for the unit to resupply with fuel and ammunition in this manner. This method would relieve the commander of the "bad weather" consideration associated with air operations. \*(See Footnote)

7. Training. Current operations have confirmed that armor NCOs are capable of commanding ACVs in combat operations. By virtue of their previous experience in armor operations and in the employment of tank weapons, the transition to ACV operations is a relatively simple task. One of the most important crew members on the ACV is the driver, since it is his training and experience that permits the exploitation of the ACVs capabilities. On the average a driver should have approximately 75 hours of ACV driving

\*Footnote: USARV feels recommendation for activation of a troop is premature at this time.

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experience before operating the vehicle in combat. The present ACV unit in RVN has noted that as the drivers reach 100 hours and more of driving experience, the vehicle is capable of clearing more difficult obstacles. The DECCA Model 202 radar has proven to be a valuable asset for day and night river operations, therefore the enlisted radar-navigator must be proficient in the use of this equipment. The remainder of the crew can operate effectively with standard armor advanced training and on the job vehicle familiarization. Maintenance and supply personnel with the MOS indicated in the proposed TOE at Inclosure 2, are capable of performing all assigned duties in an ACV organization.

8. Material. The following deficiencies in material were noted during the operations of the ACV unit:

a. Communications. The installed aircraft radios are unreliable. The unit has experienced some radio failure on every operation. The commander, ACV unit, has recommended that the present radios be replaced with the VRC-12 series. In conjunction with the replacement of the radios, the main control box for the vehicle commander needs to be relocated from the radar/navigator position to the commander's turret.

b. The unit has locally fabricated .50 cal. gun mounts for the top turrets and a rotating seat that places the side gunner on the deck outside the cabin. This position provides a better field of fire to the rear. If field evaluation reveals that these modifications are workable, they should be factory installed on future ACVs.

c. With the present vehicle configuration, infantrymen riding on the side deck cannot fire their weapons without danger of empty brass being ingested into the fan or propeller. An examination is required to determine if a modification can be made to the vehicle in order to take advantage of this additional fire power.

d. Additional equipment is required to enhance the vehicle's night capability. See detailed EEA at Inclosure 1.

e. Recommended modifications to support equipment are outlined at Inclosure 1.

f. The An/ASN-72 navigation set, position finding provides a continuous position plot on a 1:50,000 scale map within design accuracies of  $\pm 10$  meters. The map used by this set has too small a scale to permit accurate



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interpretation in marshy, rice paddy terrain which is devoid of significant terrain features. A larger scale in the order of 1:25,000 should be considered for future design.

8. It is the opinion of several persons interviewed that the ACV has great potential in the Army inventory. When considering that the current vehicle is in a "raw" state, similar to the helicopter ten years ago, one can visualize complete or partially assisted air cushion vehicles designed to bring superior fire power to bear on an enemy located in vast areas of inundated land repetitiously intersected by canals and rivers.

9. In order to provide a comparison of doctrine, organization and equipment for air cushion vehicle units, the CDC Liaison Detachment will, in the near future, submit a trip report on the three ACVs currently being utilized by the US Navy in I Corps, RVN.

3 Incl

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## SEA AIR CUSHION VEHICLE

### Fire Power

1. What problems exist regarding type of weapons now OVM with ACV? In answering this question consider the following tactical applications:

- a. Reconnaissance by fire.
- b. Reduction of bunkers.
- c. Destruction of enemy forces and materiel.

Answer:

	<u>.50 Cal.</u>	<u>M60</u>	<u>M5</u>	<u>Minigun</u>
<u>Person</u>	Good, no improvement needed	Range inadequate	Insufficient ammo supply for extensive use	Wpn unreliable, good for short range
<u>Bunkers</u>	Cannot penetrate	No effect	May temp reduce EW fire w/o lasting effect	No effect
<u>Forces &amp; Materiel</u>	Rate of fire too slow, limited terminal effect on houses, hvy vegetation and boats	Good for suppressive fire. Good for traps in open. Little effect on materiel.	Inadequate range. Good on straw huts. Little effect in hvy vegetation.	Good for suppressive fire only.

2. What limitations are inherent in the vehicle's operational characteristics that would limit use of any of the following weapons:

- a. Machine Gun, 7.62mm CAU-2B/A (Minigun).
- b. Machine Gun, 7.62mm, Armament Subsystem M6.
- c. 20mm Cannon M139.
- d. 20mm Cannon M61 Vulcan.
- e. 40mm XM174 Grenade Launcher, Pintle Mount, or follow-on improved high velocity grenade launcher.

EEA (Cont'd)

- f. 106mm RR M40A1.
- g. Guided Missile AGM-22B/(BNTAC).
- h. 2.75 in. Rocket Launcher.
- i. .50 Cal. Machine Gun M2.

What changes do you recommend?

Answer:

a. Minigun. The field of fire of the minigun is limited when mounted in the bow of the vehicle. However, it is excellent when mounted in one of the top turrets. No operational characteristic of the vehicle limits the use of the weapon, however, the water and mud environment that the vehicles operate in have caused weapon malfunctions. Additionally, the weapon is difficult to aim because of the excessive muzzle flash.

b. M6 Armament System. Because of the critical center of gravity of the vehicle, the weight of the M6 subsystem makes its use marginal. If used, the systems should be mounted one on each side of the vehicle or one system pointing to the rear.

c & d. 20mm Cannons. No experience factors are available that indicate any vehicle characteristics would limit the use of the cannon. Employment of the cannon would provide additional benefits above that of the .50 Cal. in increased range and hitting power. A message has been forwarded to CONUS requesting that a feasibility study be conducted on the possible use of these weapons systems.

e. Grenade Launcher. No vehicle characteristics limit the use of the system. Possible employment of the launcher would be as a secondary weapon for the two top turret gunners to use against close in sampans or along the high banks of narrow canals. Currently, the .50 cal. machine gun cannot be used against these targets because of mount limitations and gunners are using the M79 grenade launcher.

f. 106 RR M40A1. WESCOM has recently completed a feasibility study on the use of this weapon, however WESCOM will not authorize a safety release until the weapon has been fired from an ACV. Current plans are being formulated to accomplish this test firing in CONUS. Additionally,

KEA (Cont'd)

the ACV unit commander has stated his willingness to test fire the rifle in RVN in order to reduce the time lag in procuring these weapons. (US ARV will not approve in-country firing of 106mm rifle from ACV until safety release is authorized by TECOM).

g. Guided missile AGM-22B (BNTAC). It does not appear that any vehicle characteristic would limit the use of this system. A weapon of this type is needed immediately, to reduce hard targets, with follow-on testing of the TOW or Shillelagh missiles for possible second generation weapons systems.

h. 2.75 Inch Rocket Launcher. Although, this system has not been tested and therefore should not be eliminated from consideration, the close proximity of the ACV deck to the ground and the rocking motion of the vehicle while moving would seem to limit the use of this weapon system.

i. .50 Caliber Machine Gun. Vehicle characteristics place no limitations on the use of this weapon.

j. Although no specific changes are recommended for the weapons currently in use, work should begin immediately on testing of new systems with first priority to a weapon that can destroy hard targets, such as bunkers. Consideration should also be given to procurement of an indirect weapons system for the ACV such as the 81mm mortar with flechette filler.

3. What is the minimum standoff range required for normal operations in a cavalry role, for assault role, and for pure reconnaissance role?

Answer: No specific standoff distance can be determined for the vehicle in any role since the optimum range that a target can be destroyed is a function of target detection and weapon capability. Normally, a weapon that is capable of destroying hard targets has an inherent long range capability. What is required on the ACV is a rapid fire weapon system(s) for close in assaults and a weapon capable of destroying hard targets. What standoff distance that is required because of the enemy's capability is equally difficult to determine. Considering the type areas that ACV unit will operate in, an assumption can be made that the enemy will not be utilizing highly sophisticated or extremely large caliber weapons. The rapid closing rate of the vehicle also provides a measure of protection against anti-material weapons. In this matter, the ACV should be compared with the M551 of the armored cavalry platoon which has the same type capability that is desired for the ACV.

REA (Cont'd)

4. What limitations are there in use of any of the weapons listed in para 2 by the size or configuration of the ACV? What changes do you recommend?

Answer: Because of possible hull structure failure, it is possible that the 20mm cannon may be limited in its field of fire. As other weapon systems are tested, hull reinforcement may be required for such weapons as the recoilless rifle or mortar.

5. What affect does excessive noise, spray, etc, and other environmental hazards have on the crew ability to respond rapidly to combat situations and the application of mass fire tactics?

Answer: Excessive noise is a misconception prevalent among personnel not familiar with the ACV. While crew members wear the CVC helmet and communicate over intercom, the writer of this report carried on a conversation with the driver while underway without any problem. The vehicle commanders also report no difficulty in issuing instructions to infantrymen that are carried on the vehicles. If one thinks of the vehicle having excessive noise in relation to infantry operations, a noise problem may exist, however there is no more noise connected with the ACV than found in standard armor operations. During river operations at high speed, spray does envelop the top turret gunners, however the visor on the CVC helmet is used and gunners state that there is no hindrance to their engaging an enemy. No other major environmental problems exist that are peculiar to ACV operations. Mud, dust and rain are hazards that must be overcome by any mounted force.

6. What night observation devices are employed with the weapons in addition to radar, what additions do you recommend?

Answer: No night observation devices are being used other than the installed DECCA navigational radar which is excellent for use over water, but has a very limited capability on land. The unit commander is very desirous to equip all weapons with the crew served weapons sight and utilize the starlight scope in the hand held mode. A requirement exists to provide the driver with some type of night driving device with as much range capability as the state of the art will allow. In connection with night observation devices, consideration should be given to equipping the ACV with a PPS-5 radar so that the vehicles could be employed in the night ambush role. With adequate navigation equipment, night observation devices and a radar to complement the other equipment, these vehicles could establish numerous ambush or interdiction sites in one night. This capability

EEA (Cont'd)

should also be very successful in securing canals through remote areas.  
(See para 5, basic report)

7. What changes if any do you recommend for the present concept of module armor? Is it sufficient for operational needs? Consider vulnerability of crew and craft.

Answer: The armor plate that was installed around the cabin of the ACVs was removed to reduce weight and because it did not provide any degree of protection to the crew. Additional armor plate is required around the ring mounts on the top turrets. Other armor plate on the vehicle is adequate. Consideration was given to providing some type of armor plating for the infantrymen riding on the deck of the vehicle, however, the additional weight added to the vehicle and subsequent degradation of the vehicle's capabilities prohibit this modification.

8. What particular fire power advantages does the ACV have over the helicopters? Fixed wing? Ground mobile troops?

Answer:

a. The firepower advantage over the helicopter is the ACV's ability to carry more ammunition, a larger assortment of weapons and stay on station for a longer period of time. This does not imply that the ACV can replace the helicopter or any other weapons system, but it does increase the commander's choice of methods he may use to destroy an enemy.

b. The major advantage the ACV has over fixed wing aircraft (tactical fighter), is that the vehicle is "owned" by the ground commander and he is assured of its availability. While not able to employ the types of weapons that fighter aircraft utilize (bombs, napalm, etc.) the ACV unit can remain in the contact area much longer and physically secure the area once the enemy is destroyed.

c. With no particular fire power advantage over ground mobile troops, the ACV does have the capability to move that firepower over difficult terrain much more rapidly than can foot troops. This is a major advantage when attempting to destroy an enemy that is very elusive, and refuses to fight except on his own terms.

9. What are the fire power drawbacks?

REA (Cont'd)

Answer: Presently the major limitation to ACV fire power capabilities is its lack of a large caliber weapon that can destroy bunkers and other hard targets.

10. What tactical application makes the best use of the fire power of the ACV? List in rank order.

Answer: In answer to the above REA, probably the best tactical application for ACV units are cavalry missions in areas similar to the Mekong Delta. These missions will require the vehicle to operate in the role of reconnaissance, assault and fire support. In order to penetrate remote areas a long distance from base camps, the ACV unit must be large enough to destroy enemy units of at least platoon size. The unit must also be able to support itself logistically for short periods of time. In order to do this the following size organizations should be considered for tactical operations:

Troop (12 Vehicles)  
Squadron (31 Vehicles)  
Platoon (3 Vehicles)

11. What other individual or tactical grouping of vehicles, aircraft, watercraft, or other, best complement the fire power of the ACV? Consider the tactical applications indicated in Para 10.

Answer: Any individual or tactical groupings of vehicles, aircraft or watercraft can complement the fire power of the ACV. Seacraft, however, are rather limited because of their relative slow speed compared to the ACV and their restriction to operating in fairly deep waterways. Ground vehicles are the least able to assist because of the type terrain that the ACV operates on. The best complementary fire power would probably be from aircraft or in terms of future development another type of complete or partially assisted air cushion vehicle.

12. What missions are best accomplished by the ACV? Consider any of the above paragraphs. What missions can only be accomplished by the ACV? What missions are least likely to take advantage of the characteristics of the ACV?

Answer:

a. Based upon the limited experience gained from operations of the current ACV unit, it is the opinion of individuals connected with the ACV

## REA (Cont'd)

program that when operating in areas such as the Plain of Reeds, any mission requiring ground operations can best be accomplished by ACV units. These include, but are not limited to:

- Reconnaissance
- Security of canals
- Cordon of areas to prevent escape
- Security element for airmobile assaults
- Border patrolling
- Assaults against small enemy units
- Insertion and extraction of long range patrols
- Transport of ground troops

b. It is difficult to state a mission that can only be accomplished by the ACV, since the vehicle is not the complete solution to any particular combat requirement. In certain instances, it facilitates accomplishment of the mission, but even without ACVs, commanders will be able to determine a method for mission completion.

c. The mission that takes the least advantage of the vehicle capabilities is river patrolling since high speed is generally not required and other river patrol craft can accomplish this type mission equally as well.

## Mobility

1. What are the general environmental limitations to ACV mobility? Consider each of the following:

- a. In swamp lands.
- b. On rivers.
- c. Across rice paddies.
- d. Areas with 6'-8' feet brush lines.
- e. Areas with 10' and higher tree lines.
- f. Jungle areas.
- g. Urban areas.
- h. Dry season.



EEA (Cont'd)

- i. Wet season.
- j. Darkness.
- k. Limited visibility other than above.

Answer:

- a. Ideally suited to swamp lands.
- b. Completely at "home" in rivers.
- c. No problem in paddies with dikes less than 6 feet tall.
- d. Traversing brush lines is a matter of speed, if enough momentum can be generated the vehicle will push through.
- e. The ACV can break through a tree line one row thick, if the trees are less than 5 inches in diameter.
- f. Jungle areas are impassable to the ACV.
- g. The vehicle can operate on the fringes of urban areas, but has no application within such an area.
- h. During the dry season, the vehicle speed is slowed down when traveling over dry plowed ground. Additionally, during this season the water table is lower, which makes the dikes higher and more difficult to cross.
- i. The wetter the season, the better for vehicle operations.
- j. Until night vision devices for employment of weapons and night driving equipment are installed, the vehicle is very limited during the hours of darkness.
- k. Limited visibility due to fog, rain, dust, etc, does not halt operations, although they may be slowed down as are other type units.

2. What training limitations affect the ACV optimum mobility?

Answer: Without well trained drivers, the mobility of the vehicle is greatly reduced.

EEA (Cont'd)

3. What limitations to mobility are caused by the following:

- a. Armament.
- b. Fuel capacity.
- c. Crew fatigue.
- d. Communications.
- e. Navigational aids.
- f. Requirement for complementary escort of other weapons systems.
- g. Resupply requirements.
- h. Passengers carried.
- i. Additional equipment or stores carried.
- j. Maintenance requirements (include PLL and tools).

Answer:

- a. The weight and balance of the weapons are critical to the mobility of the vehicle.
- b. Fuel capacity is sufficient, however better fuel resupply methods must be devised.
- c. Crews are currently operating for periods up to seven hours without undue fatigue. This is not a problem in vehicle employment.
- d. As stated in the basic report, the VEC 12 series radios should be installed in the craft to improve range and eliminate some of the radio failures.
- e. Better night navigational aids are required to improve the vehicle's mobility over land. The presently installed radar for water operation is adequate. Work should commence on designing and evaluating a position indicating device for the vehicle that will enable units to know their exact location at night while moving at high speed during land operations.

**EEA (Cont'd)**

f. Complementary escort by other vehicles is normally not required. The ACV unit in RVN has only utilized such an escort twice, and these were helicopter light fire teams which presented no problem with vehicle mobility.

g. Mobility limitations, because of resupply requirements, do exist in that the ACVs must return to the operating base for refueling. When an improved refueling capability is provided, the mobility of the vehicle, in the context of limited range, will be corrected.

h. The number and total weight of passengers can limit the mobility of the vehicle. Excess weight affects the vehicle's mobility more when operating on land.

i. The total weight and the balance of equipment and stores are a factor that can limit mobility.

j. Maintenance requirements do not limit mobility since all repair parts, to include a complete ACV, can be air lifted.

4. What tactical application makes most use of the mobility of the ACV?

Answer: Cavalry operations in areas similar to the Plain of Reeds.

5. What tactical application makes the least use of the mobility of the ACV?

Answer: Patrolling of major rivers.

Intelligence

1. Does the ACV have the capability to operate extensively at night? If no, why not? If yes, in what way? What are its advantages? Disadvantages? What changes/additions do you recommend to increase its night operational capabilities?

Answer: Currently, the ACV is extremely limited in its capability to operate at night because of the lack of night vision equipment. With proper navigational aids and devices to permit weapons employment, the ACV can operate at or near its day light capabilities. Some missions that a unit could perform are:

EEA (Cont'd)

Canal interdiction  
Multiple ambushes  
Insertion/extraction of LRPs

2. How can the ACV best be employed in a combat intelligence role? What are its limitations in a combat intelligence role?

Answer: The best method of employing an ACV unit is in the standard cavalry role. The unit is limited in a combat intelligence role only by the imagination of the commander. Without any experience factor, it is assumed that the intelligence gathered by a standard cavalry unit during dry land operations could also be collected by an ACV unit in their area of operations.

3. What techniques are envisaged when ACVs are employed in conjunction with LRPs? What are the limitations of this employment?

Answer: The techniques of employing ACVs to insert LRPs will consist of dropping the patrol off at a designated site while moving through the area. Pickups will be essentially the same, except if the patrol has been discovered, the ACV unit has the fire power capability to assist in the extraction. Better navigational aids are required before the ACV can operate at night with LRPs. Because of the remote areas that ACV units will operate in, the LRP unit seems to be ideally suited for operations with ACVs, as their additional training and experience in land navigation will be of great assistance. (See para 5, basic report)

#### Command and Control

1. What means are available for internal communication of the crew? Is there a requirement for internal communications?

Answer: The standard radio intercommunications set is used by the crew. Intercom is required because of the crew arrangement. The vehicle commander stands in a turret like a tank commander and is not completely visible to the other crew members. As stated previously, while the noise level is not excessive, when all weapons are firing and the craft moving, the noise is not unlike that found in tanks.

2. How does the boat commander communicate with troop passengers? Is external communication means required?

Answer: The ACV commander communicates with infantrymen riding on the outside of the vehicle through the use of the rifle squad radio. Additionally,

REA (Cont'd)

standard tank-infantry hand and arm signals are used. When the infantrymen are operating some distance from the ACV, one technique used is to turn on the flashing red beacon mounted on the rear of the ACV. This light can be seen for some distance and means that all personnel are to return to the ACV.

3. What are the principal command and control difficulties? Consider the following:

- a. Communication equipment.
- b. Environment.
- c. Accompanying weapons systems.
- d. Accompanying troops on board or other means such as airboats or helicopters.

Answer:

a. The current radio systems are unreliable and need to be replaced with the VRC-12 series, in order to improve command and control.

b. The environment normally requires that an observation helicopter be used to assist the ACV unit in navigation. The observer in the helicopter can warn of terrain obstacles that will allow the unit to bypass them without decreasing their speed.

c. There are no additional command and control problems because of accompanying weapons systems. Sufficient radio nets are available to control attached units. Observation helicopters have only a one channel FM capability. This restricts their use by the ACV commander as he must elect to monitor the ACV frequency or that of the unit to which he is attached.

d. When operating with troops, standard tank-infantry team techniques are used and present no command or control problem. The present ACV unit has operated once as flank security for airboats, with no significant problems in the area of command and control.

4. What organization is recommended for 3 ACV operation? Six ACV operation? Nine ACV operation? Twelve ACV operation? Other?

Answer: The limited experience derived from the present unit in RVN indicates that a platoon should consist of three vehicles, a troop of 12

EEA (Cont'd)

vehicles and a squadron of 31 ACVs. Readers are reminded that all units above the platoon have not been organized or evaluated in RVN and vehicle totals are subject to change.

5. What combination of weapon systems in conjunction with various teams considered above is recommended? For example: Six ACV platoon works best with a light fire team. Describe techniques that would be employed.

Answer: For operations extended distances from base camps a three vehicle platoon is too small and a troop size unit (12 vehicles) should be used. The ACV unit in RVN has been employed with a light fire team on two occasions, on neither operation was helicopter fire support required. During the operation described at Inclosure 3, gunship support could have been utilized but was not available. It must be assumed however, that some type of fire support must be provided, either in the form of helicopter gunships, artillery, or tactical air support.

6. What is the optimum crew size?

Answer: The crew of the ACV should consist of seven men: a commander, driver, radar/navigator, senior gunner (turret), two side gunners, and an observer. See Inclosure 2 for MOS and grade structure.

7. What is the optimum platoon organization? Do you envisage an organization with various mobility modes organic to a platoon? For example: a platoon is made up of three ACVs plus two cobras and a slick.

Answer: As indicated in paragraph 4, above, a three vehicle platoon is considered optimum based on the limited experience of the present unit. It is not envisaged that a mixed platoon will be used, primarily because of the maintenance and logistical problems associated with such a unit. For tactical operations, complementary fire power can be attached or aircraft/ACV, ACV/infantry teams can be formed.

8. What is the optimum troop organization?

Answer: See Inclosure 2 for proposed TOE of an ACV troop.

9. What command arrangement makes best use of ACV capability? For example: under battalion, brigade, division or MRF control.

EEA (Cont'd)

Answer: ACV units should operate directly under division control because of their peculiar operating characteristics and the sole user parts problem.

10. What staff section (or officer) in division should have staff supervision of the ACV component? Why?

Answer: It is recommended that G3 have staff supervision of the ACV unit(s). If employed in the role of cavalry, the type missions assigned to the unit lend themselves to supervision by the G3 staff. The rationale for this recommendation is identical to that used for division staff supervision over standard armored cavalry units.

11. What additional communications are required for optimum results? What communications are excess to your needs?

Answer: As stated previously the current aircraft radios should be replaced with the VRC-12 series. Typical platoon configuration would consist of one VRC-12 and one VRC-46, mounted in the platoon leader's vehicle and one VRC-12 in each of the two remaining vehicles. There is no excess communication equipment in the unit at the present time.

12. Describe a typical operation in as much detail as possible. Attach sketches if required.

- a. One day.
- b. Two days.
- c. Three or more days.

Answer: See Inclosure 3, for After Action Report.

13. How far from a base area can the unit operate? For how long? What are its limiting considerations?

Answer: Units can operate as far from base areas as required to complete their assigned mission. The major limiting factor at present is the lack of an adequate method of refueling of the unit in the field. When this problem is overcome, distance from the base area will not require any more consideration than it does during other types of operations. For planning purposes, an ACV unit can generally operate in the field for a period of five days without requiring any major maintenance effort. At the end of

**MCA (Cont'd)**

this period they should be returned to a base area for a maintenance stand-down.

### Service Support

1. What peculiar logistic requirements are inherent in the operation of ACVs?

Answer: A major logistical requirement for ACV operation is a system that can deliver fuel to the vehicles which will normally be operating in extremely difficult terrain. Consideration must also be given to the fact that if air evacuation is required for a damaged ACV, the CH-54 is the only helicopter capable of providing sufficient lift.

2. What organization for a maintenance or service unit is recommended?

Answer: See Inclosure 2, for the type of maintenance element required to support a troop-size unit. No experience factors are available to determine what maintenance support will be required within the division base.

3. Should the troop have an integrated Direct Support maintenance capability?

Answer: As indicated in the proposed TOE at Inclosure 2, a direct support maintenance capability is required in a troop level unit. A Squadron organization will probably need a limited general support capability or a general support maintenance unit collocated with the ACV organization.

4. What area of maintenance has been the most difficult to overcome? Caused most down time?

Answer: The most difficult maintenance area to overcome has been the receipt of parts. Since the unit in RVN only has three vehicles, sufficient repair parts have not entered the supply system. One ACV has been deadlined waiting parts since 3 July 1968, other vehicles would have been deadlined also except, that the unit has been successful in using field expedients to keep the vehicles running.

5. Has the test unit established PLL?

Answer: The test unit has an established PLL of approximately 1,200 line items.



EEA (Cont'd)

6. What mobile shop sets are required?

Answer: At the present time, the ACV unit is equipped with the aircraft maintenance set "A", the "A" supplement and a UN-1 organizational tool set. Several of tools however, have not been required, other required tools are not included in the sets. The ACV unit is maintaining accurate usage records of these tools and at the conclusion of the evaluation will submit a proposal for an ACV oriented tool set.

7. What are the requirements for maintenance shelters? Is the test shelter adequate? What recommendations do you have to improve it?

Answer: The test unit has on hand one airmobile shop van, however, for a troop unit five such shelters are required, assigned as follows: one for spare parts, one armament, two general maintenance, and one communications. The shop van can be improved by placing a backing plate behind the rivets as they have a tendency to pull out of the walls. More cabinets are needed with bins for small parts. The hoist mounted on the roof needs a greater lift capacity and a non-slip surface on the floor.

8. What is primary cause for down time?

Answer: Approximately 50% of the down time on the ACVs has been caused by combat damage. Currently 2.1 hours of maintenance is required for each hour of operation.

9. How many hours are normal prior to down time? What is your preventive maintenance stand-down SOP? Do you have one?

Answer: The unit operates 50 hours between scheduled periodic maintenance, however, in the near future the time period will be increased to 75 hours with a final goal of 100 hours between scheduled inspections. The unit does not have a local maintenance SOP, but utilizes that section of the SK-5 operating and maintenance manual that describes maintenance requirements.

10. What has been your spare parts problem? Common parts? Aircraft parts? Special ACV parts?

Answer: The only major problem has been the receipt of ACV peculiar parts from CONUS. Because the unit has been in RVN for only a short time, firm procedures for receipt of parts have not been established. This problem area is now being corrected by Hq USAFV.

11. What maintenance personnel problems have you had?

EEA (Cont'd)

Answer: There have been no maintenance personnel problems. All repairmen were well trained in their MOS and the training was adequate to enable them to perform their job.

12. What materiel failures have you had?

Answer: Hydraulic and oil lubricating systems have been the major cause of materiel failures. Most of the parts that were manufactured in England failed prematurely.

13. What do you consider the greatest vulnerability hazard in short operations? Sustained operations?

Answer: Vulnerability considerations are the same on short or sustained operations. The major consideration is the same as with other units, which is to attempt to take as little damage as possible during the accomplishment of the mission.

14. What logistic considerations limit the time and/or distance the ACV can operate?

Answer: The major logistic consideration which can limit an operation is the lack of a fuel resupply capability.

15. How much of the total down time is caused by maintenance failure of:

a. Engine.

(1) Turbine air propeller pusher?

(2) Air cushion system?

b. Hull damage?

c. Air cushion envelop?

d. Communication equipment?

e. Armament?

Answer: During this visit no figures were available to answer the EEA. The unit commander is presently preparing a technical report for AVCCM, which will indicate the requested information. A copy of this technical report will be forwarded to Hq USACDC when completed.

*Army Unit 703000*  
*Av-Lashin Veh Unit*  
*1284 90 110*  
*ATO 74371*

AIR CUSHION VEHICLE ASSAULT TROOP

1. MISSION:

To provide security for the unit to which assigned or attached and as an assault unit to close with and destroy enemy forces using fire, maneuver, and shock effect.

2. CAPABILITIES

- a. Provides security for the unit to which assigned or attached.
- b. Supports combat units by fire, maneuver, and shock effect.
- c. Conducts independent action when properly reinforced.

3. CONCEPT OF EMPLOYMENT

a. Troop Headquarters. Provides command control and logistical support supervision for the troop. The troop commander is furnished one SK-5 ACV for a command vehicle. The ACV is configured with adequate weapons for self protection and sufficient communications to enter essential nets.

b. Operations Section. Provides communications, coordination, and planning for troop operations. The Operations Section is the focal point for controlling troop activities, coordinating combat and combat support elements, and maintaining communications with supported and supporting headquarters and elements. The section is provided one SK-6 ACV configured with light weapons, adequate radios to enter necessary nets and to provide limited radio relay, and space for situation maps. The operations ACV could provide the minimum essentials to support an infantry battalion command group.

*Sub 2*

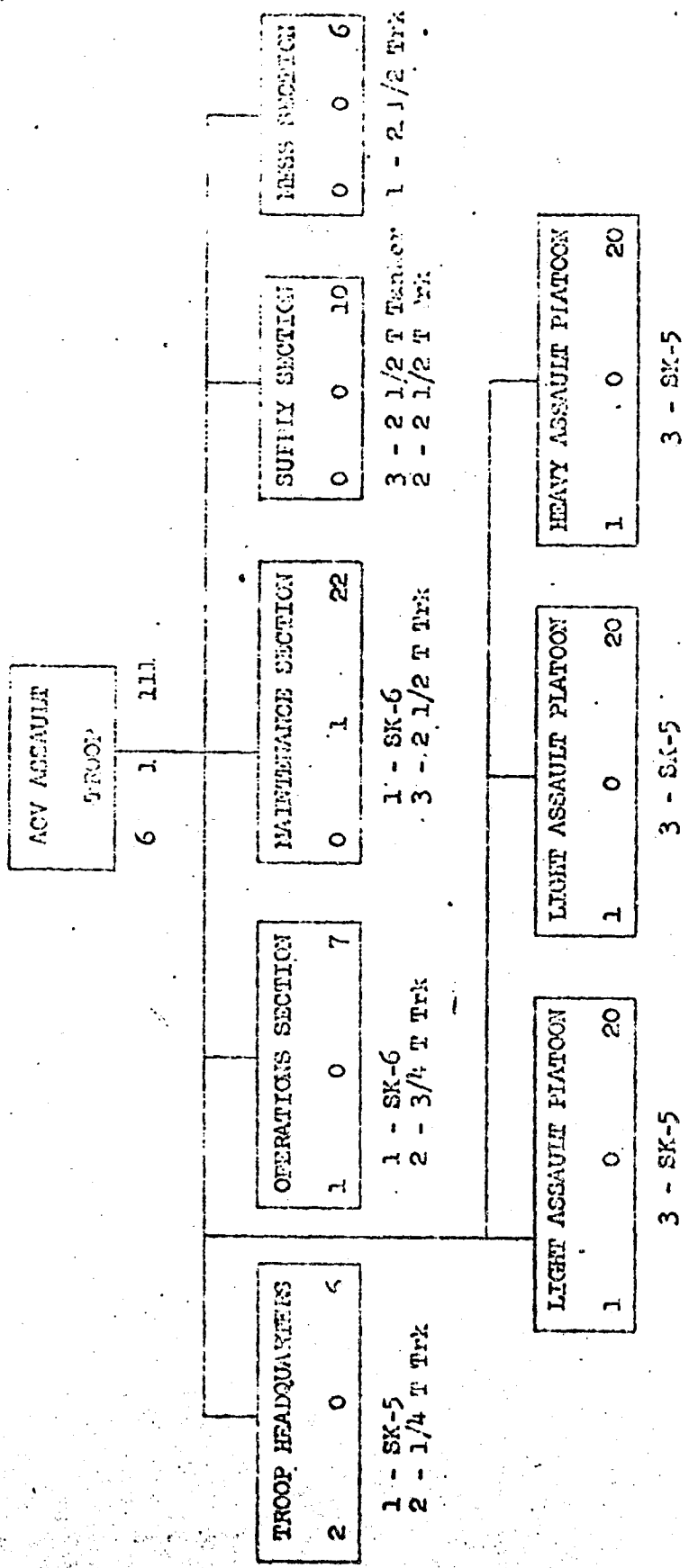
c. Maintenance Section. Provides organizational and limited direct support maintenance for the troop. The section is provided one M16 ACV configured with light weapons, communications, tool and parts storage, limited power tools and work space, and various recovery aids. The maintenance ACV would provide adequate facilities to effect battle field repairs or evacuation of inoperative air cushion vehicles. Evacuation would be accomplished using a plenum bleed duct system.

d. Supply Section. Provides normal supply support for the troop. The section can carry enough fuel for one stop servicing for the troop.

e. Mess Section. Provides the troop with normal messing facilities organic to a separate company sized unit.

f. Light Assault Platoon. Provides security, reconnaissance, and rapid fire weapons support for the troop. The light assault platoon performs missions similar to cavalry scouts employed on advance or flank guard missions. The high noise level of the vehicles makes the use of stealth impracticable; instead the platoon uses tactics designed to force the enemy to expose its positions. The platoon then relies on its mobility and fire power to destroy the enemy or to extricate itself.

g. Heavy Assault Platoon. Provides heavy weapons fire support for the troop. This fire may be direct, indirect or a combination of both. The heavy assault platoon is used as a base of fire when the troop conducts fire and maneuver, as an assault force to destroy enemy forces/positions discovered by the light assault platoons, and as a fire support element for other combat forces.



<u>POSITION TITLE</u>	<u>GRADE</u>	<u>MOS</u>	<u>SENIORITY</u>
<b>Troop Headquarters</b>			
Troop Commander	MAJ	1204	1
Executive Officer	CPT	1204	1
First Sergeant	E-8	11D50	1
ACV Driver	E-6	11D40	1
Radar Navigator	E-5	11D40	1
Troop Clerk	E-5	71H20	1
ACV Gunner	E-4	11D20	2

8

#### Operations Section

Operations Officer	LT	1204	1
Operations Sergeant	E-7	11D40	1
Intelligence Sergeant	E-6	11D40	1
ACV Driver	E-6	11D40	1
Operations Clerk	E-5	71H20	1
ACV Gunner - RFO	E-4	11D20	2
Commo Chief	E-6	Note 1	1

8

#### Light ACV Assault Platoon

Platoon Leader	LT	1204	2
Platoon Sergeant	E-7	11D40	2
Vehicle Commander	E-7	11D40	2
ACV Driver	E-6	11D40	6
Radar Navigator	E-5	11D40	6
M5 Gunner	E-5	11D40	6
Window Gunner	E-4	11D20	12
Observer	E-4	11D20	6

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#### Heavy ACV Assault Platoon

Platoon Leader	LT	1204	1
Platoon Sergeant	E-7	11D40	1
Vehicle Commander	E-7	11D40	1
ACV Driver	E-6	11D40	3
Radar Navigator	E-5	11D40	3
Senior Gunner	E-5	11D40	3
Window Gunner	E-4	11D20	6
Observer	E-4	11D20	3

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<u>DEPT DIVISION</u>	<u>GRADE</u>	<u>MOS</u>	<u>GEN. INGT</u>
<u>Maintenance Section</u>			
Maintenance Officer	WO	671B	1
Maintenance Supervisor	E-7	67240	1
Senior Turbine Mech	E-6	68240	1
ACV Driver	E-6	11D40	1
Motor Sergeant	E-5	63C40	1
Turbine Mechanic	E-5	68D40	3
Sheet Metal RPR	E-5	68G20	1
Propeller RPR	E-5	63E20	1
Aircraft Armament RPR	E-5	45J20	1
Plumber Repairman	E-5	26M20	1
Repair Parts Spec	E-5	76Q20	1
Sr Radio RPR	E-5	Note 1	1
Turbine Helper	E-4	63B20	2
Wheel Vch Mech	E-4	63E20	2
Sheet Metal RPR	E-4	68G20	1
Propeller RPR	E-4	68E20	1
ACV Parts Spec	E-4	76Q20	1
Radio Repairman	E-4	Note 1	2
			23

Supply Section

Supply Sergeant	E-6	76Y40	1
Supply Clerk	E-5	76Y20	1
Small Arms RPR	E-4	45B20	1
Fuel Hand Spec	E-4	76W20	3
Armo Stor Spec	E-4	55E20	2
Armo Stor Helper	E-3	55A10	2
			10

Kess Section

Kess Sergeant	E-6	94B40	1
First Cook	E-5	94B20	2
Cook	E-4	94B20	2
Cook Helper	E-3	94B20	1
			6

TOTAL FOR UNIT 118

Note 1: MOS Dependent on type radios installed.

AIR CUSHION VEHICLE UNIT  
HHC, 3rd Brigade, 9th Inf Div  
APO San Francisco 96373

SUBJECT: After Action Report, 1-5 July 1968

1. General.

a. The Air Cushion Vehicle Unit was attached to the 3d Infantry Brigade, 9th Infantry Division during the period 1-5 July for operations in the PLAIN of REEDS. The primary missions assigned to the unit were reconnaissance-in-force and blocking force roles. Troops from the 3d Brigade and the My Phoc Tay Special Forces CIDG were made available for the unit's use, as was the continuous use of one H-23 helicopter.

b. The base of operations for the period was the My Phouc Tay Special Forces Camp, XS201600. Supplies and equipment required were air transported to the camp on a daily basis. Direct communications between the unit and the Brigade rear at Dong Tam were maintained with PRC-25 and VRC-47 radios.

c. During the operation, enemy contact resulting in an exchange of fire was made three times. Twelve detainees were evacuated to Dong Tam, several of whom were identified as PW's. The total confirmed body count for the operation was eleven; however, the battle area of 3 July was not searched so total enemy casualties inflicted by the unit are not determined.

2. Movement to the base camp and operations - 1 July.

a. Operations. The unit departed Dong Tam base camp 1 July for the My Phouc Tay Special Forces (SF) Camp. About ten miles from Dong Tam, eighteen 3d Brigade infantrymen were picked up to ride the side decks. The initial plan was to carry 24 troops, but the weight proved to be too great. The movement to the initial area of operations was delayed several times while waiting for additional air assists to be made available. One H-23 helicopter was made available for the ACV commander to control the operation. The first area the unit was assigned consisted of a large populated triangular shaped rice bowl about five miles east of the SF camp. According to the Vietnamese Camp Commander, the area was completely Viet Cong controlled and earlier in the year the SF had lost 200 CIDG and 8 advisors in the triangle. A detailed house-to-house search was made of the area resulting in eleven detainees, most of whom were identified as PW's. The vehicles were deployed generally on line in the sweep through the area. Key houses were occupied for short periods of time to insure that the vehicle would not be ambushed, not caught in a cross fire, or not be able to mutually support one another. After completing the sweep of the triangle, the unit moved directly to the

*Encl 3*



SF camp to set up the base. Supplies were brought in and coordination made with the Camp Commander for security and fire support.

b. Terrain. The terrain for the days operation varied from the open water of the My Tho river to very rough and confined tree line breaks. The first 25 kms of the operation consisted of moving up the XANG Canal at high speed. The canal is about 100 feet wide and averages about 15 feet deep and no particular problems were encountered. At the triangle, some searching was necessary to find a place to get through the tree line. The gap found had 2-3 foot banks and very high grass and brush, the vehicles easily jumped the bank and brush. The tree line immediately opened up to a large open space covered with 3-4 foot elephant grass. Once again a search was necessary to find a gap in the tree line separating the elephant grass area from the rice fields of the objective. This time it was necessary to knock down several small trees and jump a small canal, all of which was accomplished with delay. The rice paddy village, which was the objective area, was about 6 kms long and 4 kms at the widest. The paddies had 4-8 inches of water and new growth rice, the dikes were spaced about 100 meters apart. Approximately every 1000 meters, a small canal had to be traversed. Except where trees obviously blocked the canals they could be crossed at will. ACV #902 was hung up once trying to cross an area where two of the larger canals intersected. The H-23 had returned for refueling and the size of the canals and their banks was not apparent from the ground. The vehicles had been moving slowly to keep generally on line with the undersigned warning them of large dikes or canals, in which case the driver would pick up power to get across. If such warning had been given, the vehicle would not have been hung up. It was pulled free using ACV 903. The only access from the western end of the triangle to the SF camp was through two heavy tree lines and up two medium sized canals. No breaks in the first tree line had been apparent on an earlier air reconnaissance; therefore, the Air Force FAC was asked to try several bomb strikes on the trees in hopes of blowing through a hole. Two gaps were made, one using a large bomb which cleared the trees, but left too large a crater (it will fill with water in time and be usable). The other was made with several smaller bombs, which left a rougher place, but at the time more usable. The gap was negotiated without major problem, the first vehicle had to finish knocking over a large tree which caused a small dent (no repair necessary). The remainder of the 5 miles to the SF camp was accomplished without incident, except that ACV 902 could not overcome hump drag in the two shallow canals. Each appeared to be about 5-8 feet deep. This was one of several times that the relative lower SHP of ACV 902 has been noticeable. The other two vehicles had no trouble accelerating over hump drag. The base area was an old French outpost that has long since disappeared. In the middle of June, a small engineer force was moved to the outpost with two small dozers by CH-54 helicopters. The area was leveled and three parking pads constructed using rubber fabric cloth and M8 steel matting. The area had baked hard enough so that dust was

not a problem, and the hardstand assisted in keeping the crews out of the mud during the daily monsoon downpour.

c. Logistics. In addition to the engineer effort previously accomplished, the following logistical support was required: JP-4 fuel, fresh water, ammunition, and C-rations. A four day load of rations and ammunition and enough fuel and water for two days was air supplied. A R&J 100 gpm fuel service system was issued for use with standard 500 gallon fuel bladders. Water was transported in a standard 400 gallon water trailer. Three complete basic loads of ammunition were moved along with 4 days rations. The small air-mobile shop that has been loaded with parts, tools, and equipment was also moved up. A total of five CH-47 Chinook sorties were used. The prime objective was to get minimum essential support moved to the base and to keep the logistical support as simple and flexible as possible. The only problem encountered was finding enough people to prepare and hook up supplies at Dong Tam, and to unhook and distribute them at the forward base. The S-4, 3d Brigade, finally came to the rescue and provided a five man detail, a rigger, and a 2½ ton truck with driver. The success of the entire logistical support far exceeded expectations and conclusively proved that the unit can operate for extended periods in the field without elaborate or costly support packages. The only shortcoming experienced was the fact that the vehicles had to return to the base to refuel. Each day's operation involved a well planned move to an operational area some distance from the base. The additional round trip to the base for refueling would have unduly placed the vehicles in jeopardy of ambush. The problem was "solved" by carefully pacing the vehicles to stretch the fuel; this economy resulted in on-station times in excess of six hours. However, if the unit had been required to continuously move at moderate or higher speeds, the time would have been cut by a third or more. See annex \_\_\_\_\_ for a recommended solution.

### 3. Operations - 2 July.

a. Operations. The ACV unit was scheduled to conduct a reconnaissance-in-force mission in a 40 square kilometer area of operations. For the mission 24 Vietnamese CIDG troops and 2 American Advisors were attached. Shortly after leaving the base, ACV 901 hit a high canal dike attempting to get out of the MUOI RAI canal. The banks of the canal were very high and steep; after several unsuccessful attempts to get out, a low spot was found that appeared to be negotiable; however, the place was narrow and the driver misjudged the slope catching the right side deck on the high side of the hole. The vehicle spun in tearing a 20 foot section of skirt off and denting the bouyancy tank. The remainder of the morning was consumed in stripping the vehicle, having the sling brought up from Dong Tam, transporting the equipment off 901 back to the forward base, and slinging 901 out by CH-54. At 1300 hours the mission was again resumed with the two vehicles, but without the CIDG. Four 3d Brigade troops were carried on each vehicle. The afternoon mission was uneventful

except as an opportune test of the vehicles mobility in high, thick grass, scrub brush, and in crossing deteriorated canal banks. Numerous houses, bunkers, etc. were checked out without incident. Four large bunkers were destroyed.

b. Terrain. The MUOI HAI canal is a large and well traveled route between CAI LAI and MOC HOA. The banks are unusually high and steep, possibly as a result of the constant boat traffic. At times there is a four foot tide in the canal, but it is not predictable using current tide tables. If operations in the future require the vehicles to traverse the canal, attempts will be made to knock down ramp areas using AF bombs or demolitions. The open areas, the PLAIN OF REEDS proper, are ideal for the ACV; at times the H-23 could not keep up with the vehicles. At the present time the grass is about a foot high and the ground covered with 3-4 inches of water, as a result the air escaping out the front of the skirts slicks down the green grass and the ACV becomes faster than at the best water conditions. At first, stopping was a problem for the drivers; however, it was discovered that low speed "plough-ins" were as smooth as on the water and that reverse pitch had more effect than over water. Many of the driver techniques required to operate over ice have proven helpful in the grass. (Ice operations were experienced during the training period at Aberdeen Proving Grounds).

c. Logistics. No problems encountered. The CH-54 was on station less than two hours after requested. At Dong Tam the pilot released the sling before it was lowered to the deck knocking a two inch hole in the bondolite deck.

#### 4. Operations - 3 July.

a. Operations. Two US Battalions and a Vietnamese CIDG company conducted an air assault into a triangle area bounded on three sides by medium canals (SO MUOI, PHU HUYEN, TONG DOC LOC) nine miles to the west of My Phouc Tay. The ACV unit was assigned the mission of establishing a blocking force along the east side of the SO MUOI canal. Fifteen Vietnamese CIDG and two American Advisors were attached to the unit and rode the side decks. A direct route to the objective area was not available; therefore, the length of the route was about 15 miles due to the circumnavigation of the heavy tree lines. The trip was made at maximum speed and without incident. All suspicious areas were reconned-by-fire and a couple of narrow passage ways checked out by dismounting the troops. Once visual contact was established with the infantry battalions, the unit began a wide zone reconnaissance along the canal. The speed of the vehicles allowed the unit to range up to 4 kms from the assigned axis and still maintain an adequate blocking force. During the day over 60 houses were investigated, 26 bunkers destroyed, and I confirmed

PW apprehended. At 1100 hours one VC was observed running from the approaching vehicles by the crew of 902, was fired upon, and was seen to tumble off the dike on which he was running. Since the area was fairly heavily wooded the CIDG were reluctant to go into the area to get their weapons as they feared an ambush. About an hour later both vehicles were fired upon with small arms from a tree line. After thoroughly saturating the area with machine gun and 40mm grenade fire the CIDG were sent in to check over the area. Two bodies were found with web-gear and weapons. The unit remained on-station over six hours and was released about 1700 hours to return to the base camp. A route different from the one used in the morning was selected and again traversed at high speed using recon-by-fire techniques. Approximately 4 miles from the base several VC were spotted running along a tree line and were immediately engaged. This action touched off a violent fire fight with an enemy force dug into the tree line. The VC force was dressed in blue shirts, black pants, and had a white band around their heads. Weapons used included caliber .50 machine guns, AK-47's, M1 rifles, carbines, and a number of other unidentified automatic weapons. Indications were that the VC unit was taken by surprise. Many of the VC were fighting from open bunkers, one of the .50 machine guns had so little overhead cover that it was blown off with the M5 40mm grenade launcher, and no recoilless weapons were used. At times during the battle the vehicles were as close as 100 feet and one VC was run over by ACV 902 instantly killing him. The vehicles, crews, and weapons (except the minigun) all performed extremely well. Contact was held as long as possible waiting for an airmobile assault to finish up the fight; however, the infantry units had already moved into RON positions and were not immediately available. Before the infantry unit could be moved the ACV unit had to break contact as the vehicles had taken so many hits, two men were seriously wounded, the engine on 903 had a hole in the power stage, and the hydraulic system of 902 had been shot out. The vehicles moved clear of the area to make temporary battle patches, evacuate the wounded (the H-23 was used), and to maintain visual observation of the area. After a few minutes mortar rounds began to fall around the vehicles and it was necessary to move further away. Eight VC bodies were counted laying in the open, but the airmobile assault never materialized so the total VC casualties are unknown. The vehicles were driven the remaining 3 miles to the base with some difficulty. ACV 903 lost all oil pressure just as it pulled up on the pad and ACV 902 was nosed up on the pad; it had come part of way down the canal and had to cut off its power. In each case when enemy contact had been made during the day, helicopters had been working in the area, the H-23 C&C and air cavalry scout LOH's. In none of the cases had the aircraft spotted any of the activity until the vehicles were engaged. This is an excellent example of the necessity to control the ground and have something occupying terrain, neither of which can be accomplished by aircraft. It also points out the limitations of aerial observation when working in heavy foliage areas.

b. Terrain. The terrain was mostly very level, with a few small canals. The only dikes encountered were around the built-up areas. The larger tree lines proved to be more difficult to get through than anticipated; one tree line ran for over 4 miles with only two small breaks in it. Due to the very flat ground and excellent observation, reconnaissance-by-fire techniques paid handsome dividends especially when making high speed runs to move from one area of interest to another.

c. Logistics. Fuel almost became a problem as the vehicles each averaged over seven hours of operation by the time they returned to base. An air transportable refueling system would have been useful. The critical damage to ACV 902 was repaired with the tools and parts in the small maintenance shop, thus paying for itself in one day.

#### 5. Operations - 4 July.

The decision was made by the 3d Brigade to fly both vehicles back to Dong Tam by CH-54. The vehicles were stripped and the items loaded in A-22 containers. The excess fuel and ammunitions was moved into the SE camp proper for future use. The vehicles, shop, water trailer, and A-22 containers were air lifted back to Dong Tam without incident or problem.

#### 6. Lessons Learned:

a. The ACV can be operated and maintained for extended periods away from the permanent base camp.

b. The best type of terrain for the ACV is the PLAIN OF PEEDS or areas very similar to it.

c. The commander of the ACV unit must be provided a Light Observation Helicopter for command and control. The only time the vehicles were stuck or lost was when the H-23 had returned for fuel.

d. An air transportable refueling capability must be devised/constructed.

e. The ACV can find the enemy, make contact, and maintain the contact for short periods of time. More vehicles are an absolute necessity if any extensive operations are anticipated or if it is envisioned that the vehicles do more than make contact, stage a brief fight and then retire from the battle field for 2-3 weeks for repairs. At present there is no hope of the unit fighting to a satisfactory conclusion in any large engagement.

f. The ACV contributes to the battlefield a combat vehicle that can fight and hold terrain in areas impassable to tanks or wheeled vehicles. This is a capability not possessed by any other item in the Army inventory.

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